

Energy Assessments – Today's Modern Treasure Hunt

Kansas Environmental Conference
Hutchinson, Kansas
August 10, 2016

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KANSAS STATE
UNIVERSITY

College of Engineering
Engineering Extension



K A N S A S

SBEAP

Small Business Environmental Assistance Program

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- SBEAP/PPI
- Energy Management
- Treasure hunt video
- Performing an energy assessment
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Small Business Environmental Assistance Program

- Environmental compliance assistance
- Multimedia [air (mostly), waste, water, energy, GHG inventory and reporting, and EMS]
- Free to small- and medium-sized businesses (KDHE funded)
- Confidential
- Staff located throughout the state

Contact Information

Web site: www.sbeap.org

Hotline: 1-800-578-8898

Email: sbeap@ksu.edu



Energy Management

- Sum of Major Fuel Consumption for “All Buildings, 2012”
 - 5,557,000 buildings
 - 87,093 million square feet
 - 6,963 trillion BTUs
- 2010 Energy Consumption by “Manufacturers”
 - 2,094 trillion BTUs; includes 95,546 million kWh
- Energy Information Administration -
<http://www.eia.gov/consumption/data.cfm#mfg>

Electricity Prices – Kansas (cents/kWh)

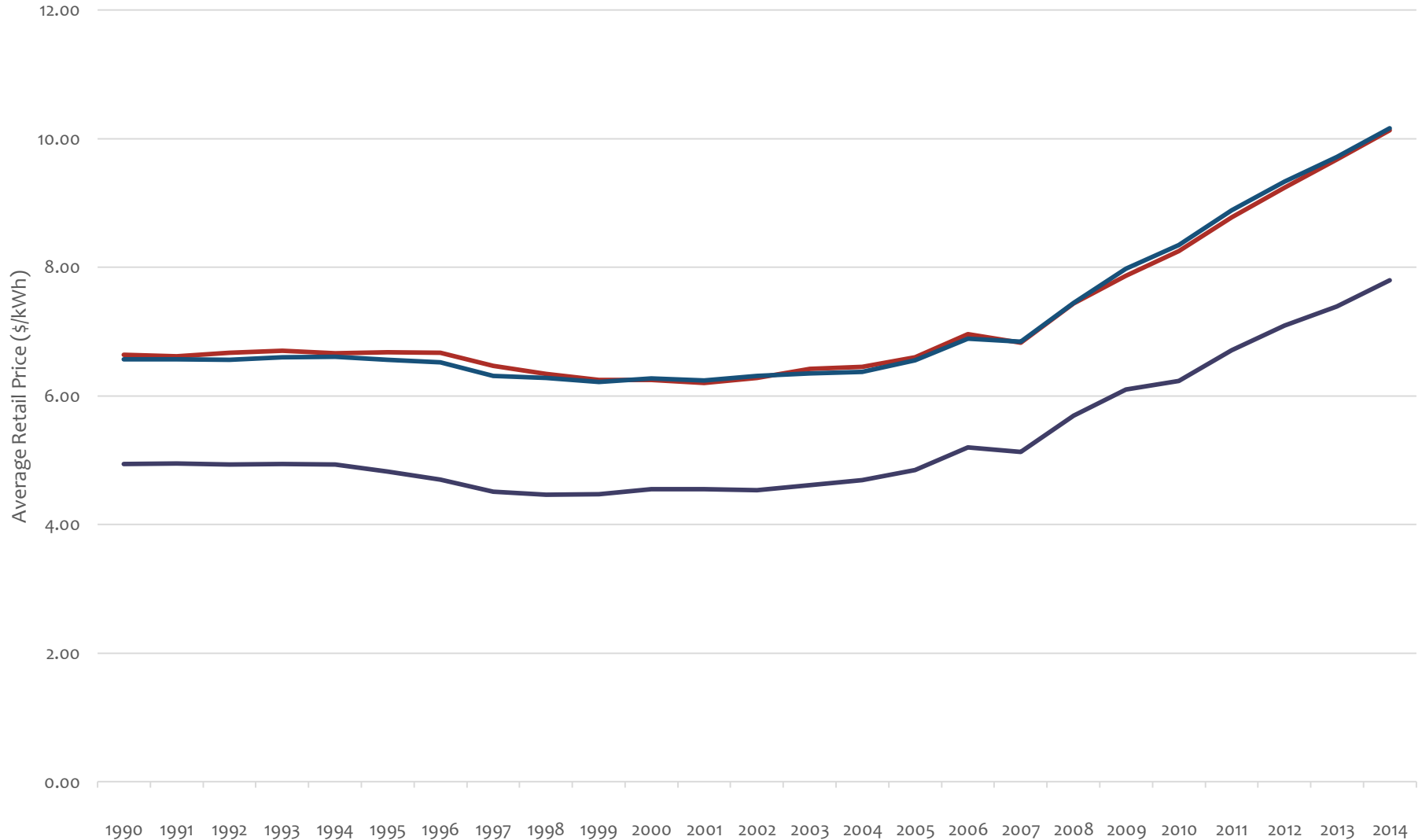
| Month/Year | Residential | Commercial | Industrial |
|------------|-------------|------------|------------|
| May 2016 | 13.79 | 10.44 | 7.43 |
| May 2015 | 12.95 | 10.14 | 7.39 |

https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a

Electric Rates

Price of Electricity (1990-2014)

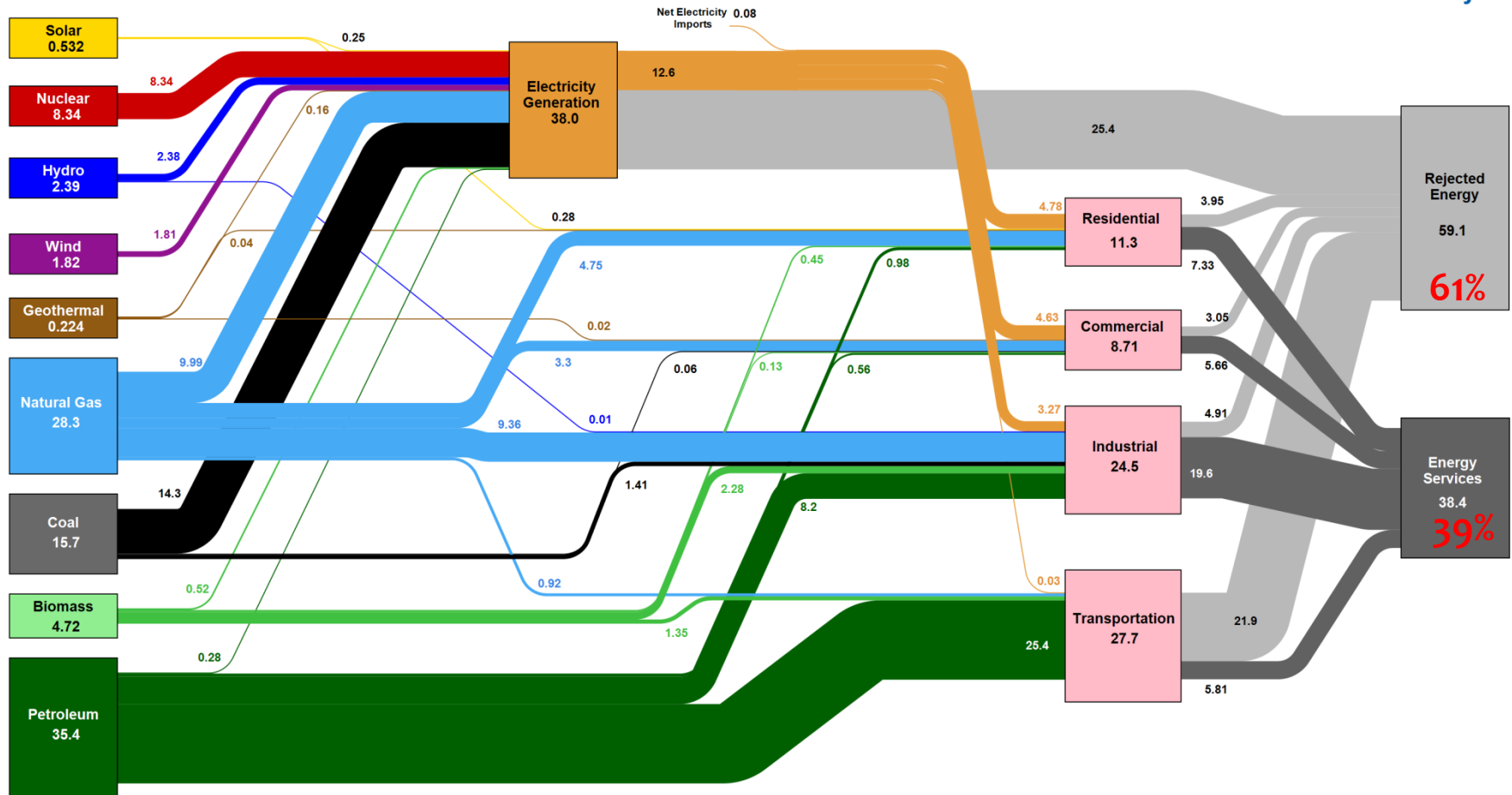
Commercial Industrial Total



Energy Star Statistics

- Nearly 6 million commercial buildings and industrial facilities
 - 5.6 million commercial buildings
 - 346,000 industrial facilities
- \$400 billion in annual energy costs
- 30 percent energy inefficiency

Estimated U.S. Energy Consumption in 2015: 97.5 Quads



Source: LLNL March, 2016. Data is based on DOE/EIA MER (2015). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527

GE's Energy Treasure Hunt

www.youtube.com/watch?v=TUbb5BXoSLs&feature=player_embedded

What Do You Need?

- Awareness
- Map
- Tools

Isabella Sea

The Brandy Ocean

Cannonball Bay

Hylo Beach

Nato's Rock

Ash Rocks

Isla Rivora

The Thomas Sea

Jelly Focke Galloen

Rodolph's Rocks

Jelly Focke Bay

Guano's Bay

Snakebite Narrows

Randal City

Jelly Dodger Sleep

Lighthouse

Portho's Way

Spanish Jack's Cove

Dead Rope Point

Pony Point

Sunny Harve

N

Scarlet Cove

La Isla Vel Pirata

El Rgider

Broken Island Beach

Richard's Lagoon

Bloody Wench Galloen

Palm Beach

Yark Town

Cuffs of France

Pirate Settlement

Morgan Shallow's

P. Pique's Landing

Madame Lucia's Tavern

Carbone Sea

Rumtown's Dock

Port of Sillous

Lantern's Hole

Dead Rock of Fishes

MAP

La Islas Hispania 1697

per cabo de bara

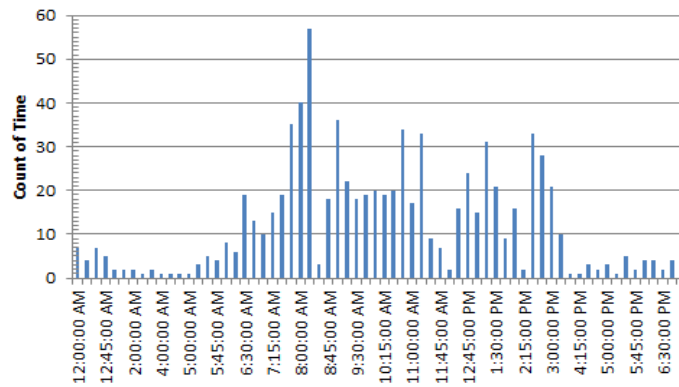
Areas of Potential Savings

- Lighting
- HVAC
- Motor Systems
- Compressed Air
- Building Envelope
- Cogeneration/Combined Heating and Power
- Water Conservation

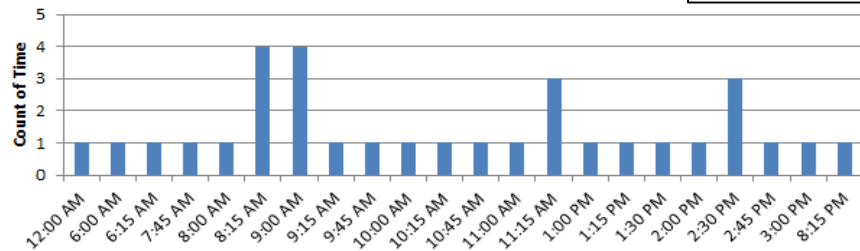
Get a map

- Building layout
- Energy audit checklists
- Equipment inventories
- Utility records

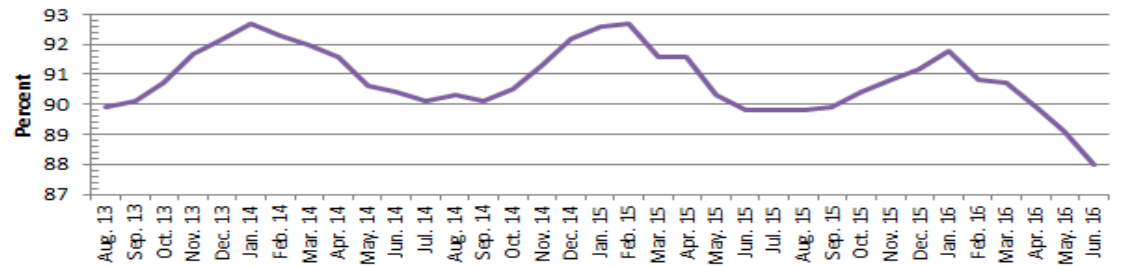
Peak Demand Time, Daily



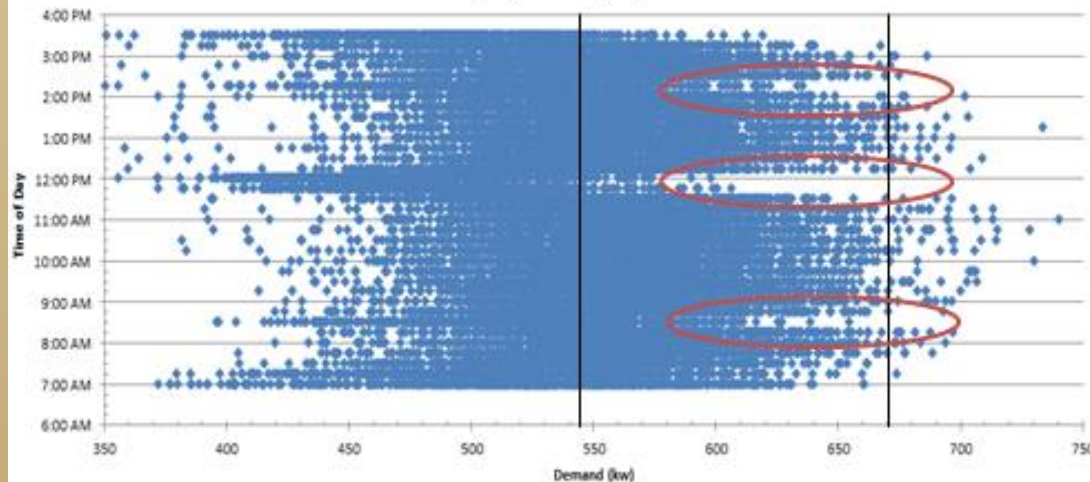
Peak Demand Time, Monthly



since August 2013



10/28/13 to 5/27/16



The simplified approach

No-cost actions and maintenance – 5-15% savings*

- Step 1: Get out of your office
- Step 2: Dedicate time to walk around your facility
- Step 3: Use a new set of eyes

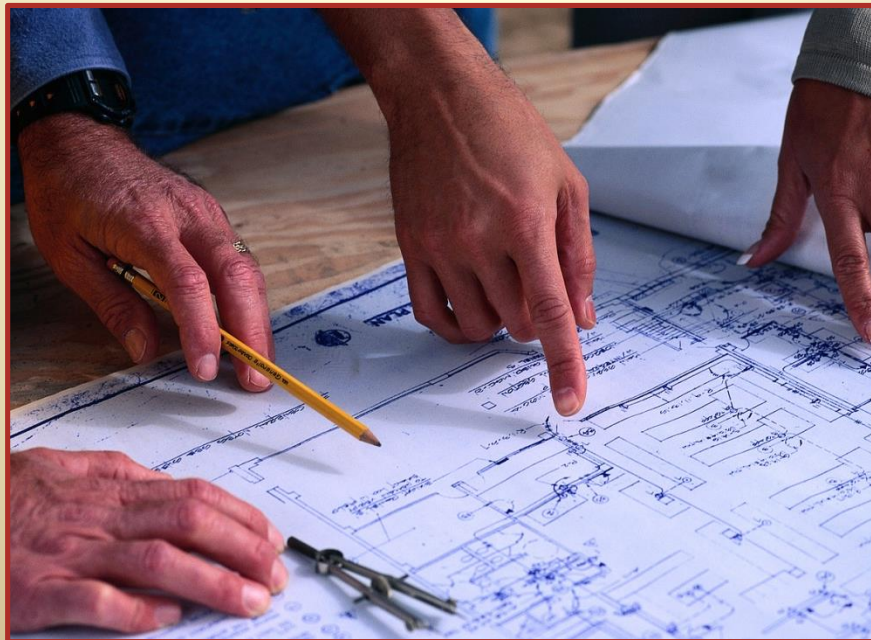
*Association of Energy Engineers

The detailed approach

- Step 1: Assign Responsibility
 - For smaller companies, this may be the owner or manager
 - For larger companies, it may be necessary to form an energy team
- Step 2: Gather data
 - Utility bills from previous 12-months or more
 - Production records (to compare with energy usage)
 - Is sub-metering present within your facility?

Performing your own treasure hunt (the detailed approach)

- Step 3: Walk around facility and analyze findings/data
 - Make sure to speak with employees
 - Review manuals and drawings of building equipment and mechanical systems to determine, size, age, type, etc.



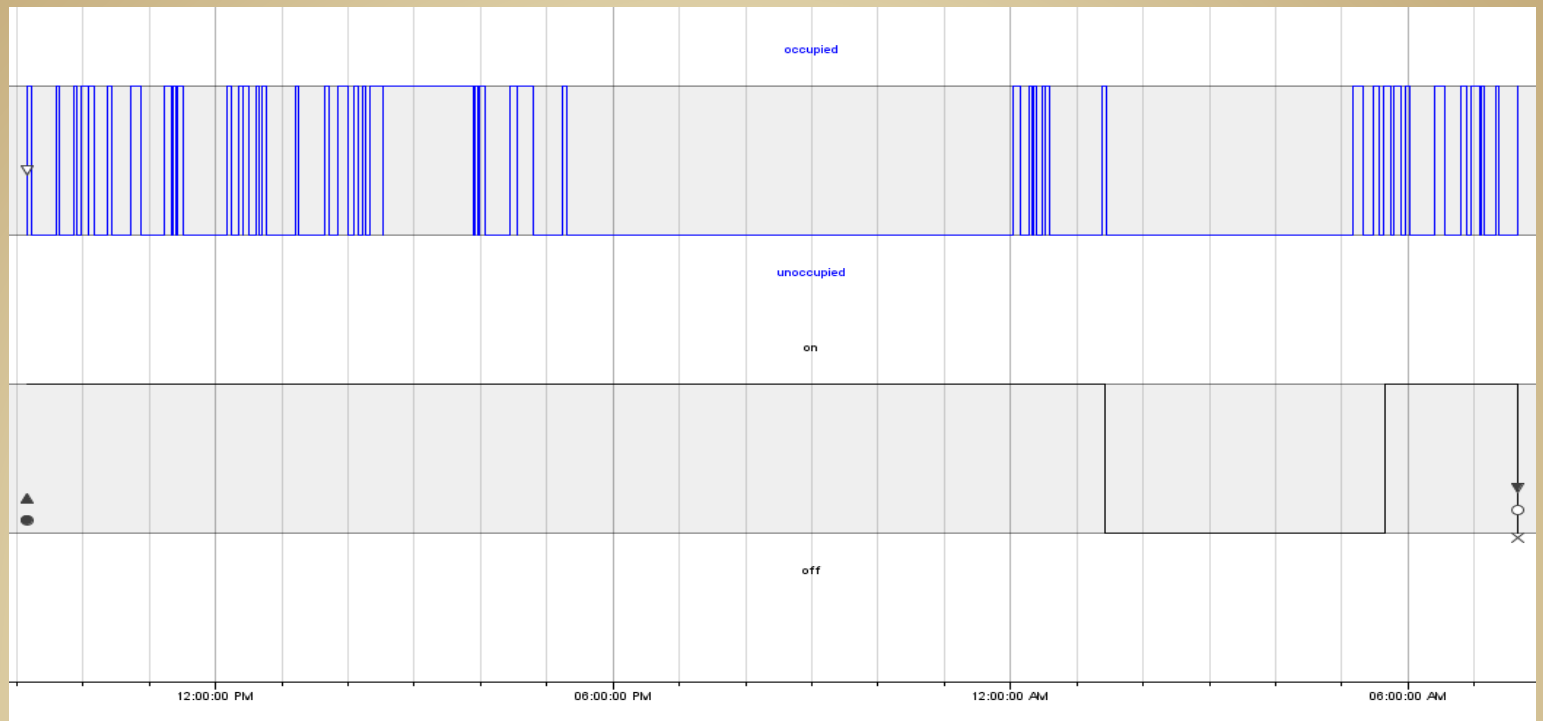
Treasure Hunt Tools



200472255-001
www.fotosearch.com

Instruments

- Ultrasonic leak detector
- Combustible gas analyzer
- IR camera
- Differentiator
- Light meter
- Multimeter
- Dataloggers
- IR thermometer



Checklists

- Energy Efficiency and Renewable Energy -
http://www1.eere.energy.gov/femp/services/energy_aware_oec.html
- Industrial Technology Program -
<http://www.energysavers.gov/industry/20ways.html>
- Industrial Audit Guidebook, Bonneville Power Administration,
http://www.bpa.gov/energy/n/industrial/pdf/audit_guide.pdf
- Cooperative Extension Washington State University Energy Program,
<http://www.energy.wsu.edu/documents/rem/energyaudit/OMchecklists.pdf>

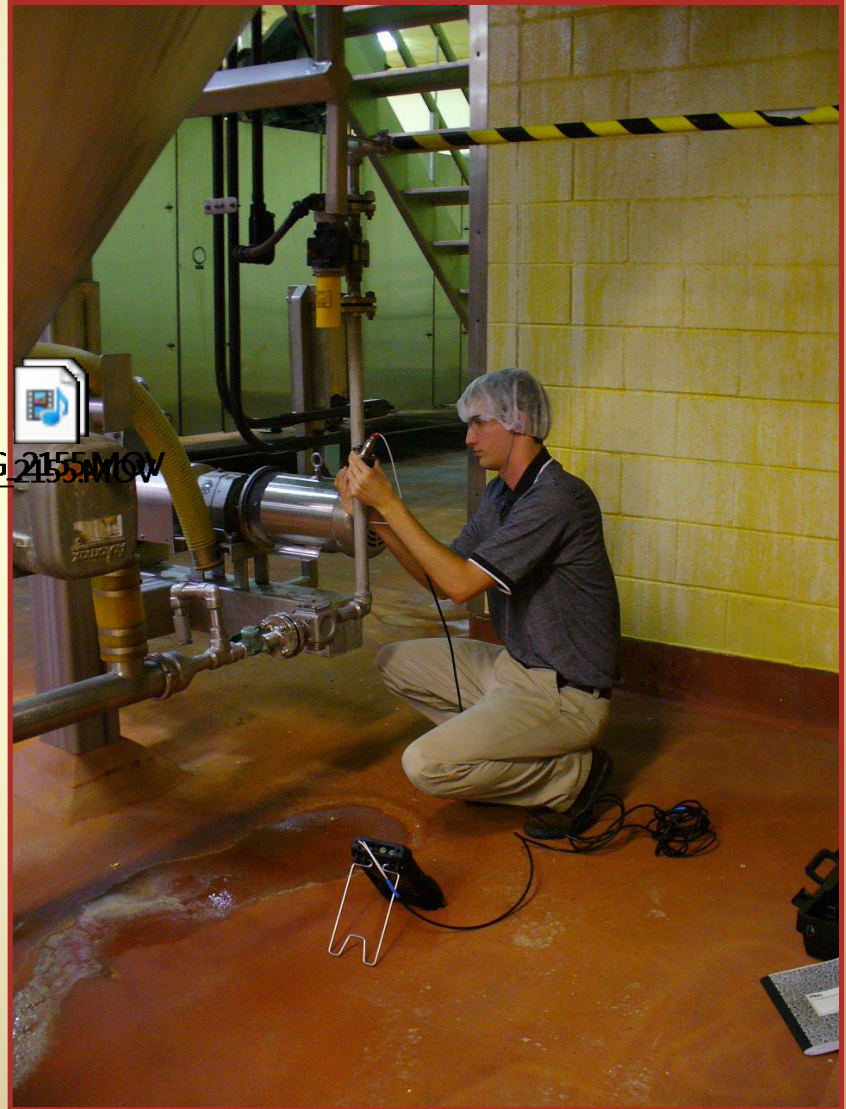
Resources

- DOE Save Energy Now
 - Funded through the Industrial Technologies Program, Department of Energy
 - Average of \$2 million/industry, 8% of facility's total energy cost
 - No cost-energy assessments
 - Large plants – 3-day energy audit
 - Process heating, steam, compressed air, fans, pumps
 - Medium plants – 1-day energy assessments via IAC
 - <http://www1.eere.energy.gov/industry/saveenergynow/>
- Industrial Assessment Centers
 - Free energy assessments
 - \$100,000 to \$2 million in energy costs
 - Max 500 employees
 - Max \$100 million/year gross annual sales
- K-State Pollution Prevention Institute Intern Program
- Energy Star

Background of E2/P2 Intern Program

- Pollution Prevention Grant
- Partnership with EPA, KDHE, K-State Engg. Extension
- Fourth year of program (2006 Pilot year)
- Pairs engineering and environmental sciences students with business and industry
- Collaborations focus on projects to reduce energy, emissions, and wastes, while benefiting the KS environment.

Real-world industry experience

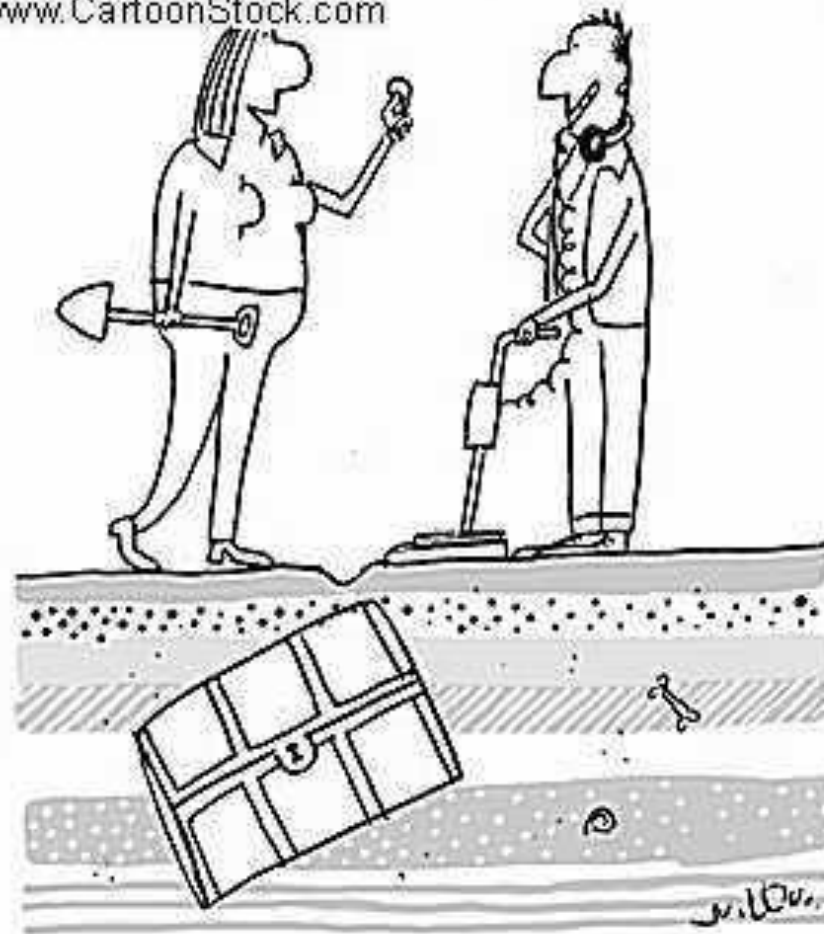


Environmental Results

| IMPACTS | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total |
|--|-------|-------|--------|-------|-------|-------|-------|-------|--------|-------|--------|
| Water (million gallons) | N/A | 25.4 | 187.1 | 9.9 | 22.2 | 6.0 | 11.8 | 7.8 | N/A | 10.2 | 280 |
| Waste (tons) | 1,025 | 5,506 | 1,707 | 6,720 | 585 | 318 | 126 | 519 | N/A | N/A | 16,500 |
| Energy (MWh) | 1,533 | 7,066 | 26,019 | 8,705 | 6,158 | 5,723 | 6,548 | 4,322 | 487 | 2,859 | 69,422 |
| Operating/ disposal \$ (million \$) | \$0.4 | \$1.5 | \$3.5 | \$0.9 | \$1.2 | \$0.6 | \$0.7 | \$1.8 | \$0.05 | \$0.4 | \$11.0 |
| Greenhouse Gases (MTCO ₂ e) | 1,089 | 5,079 | 18,921 | 6,207 | 7,080 | 3,996 | 2,608 | 4,260 | 346 | 2,843 | 52,400 |

Treasure!

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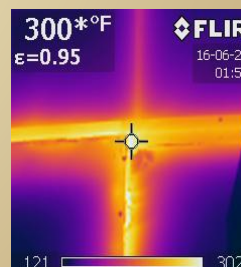
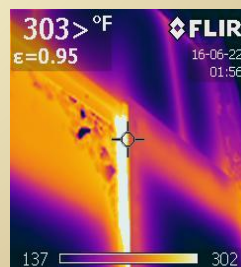
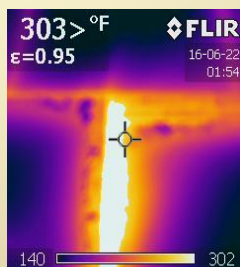
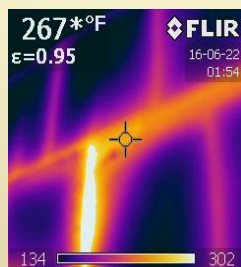
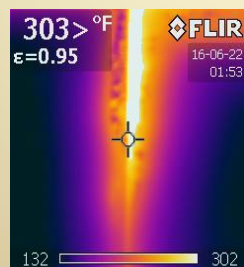
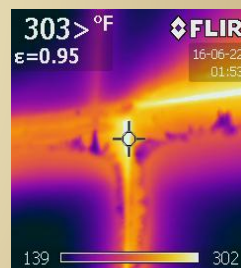
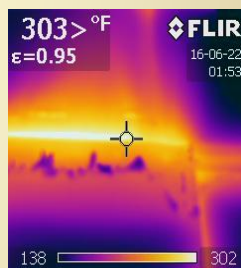
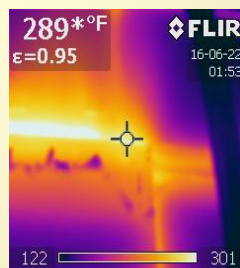
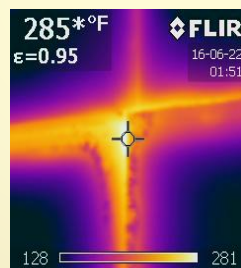
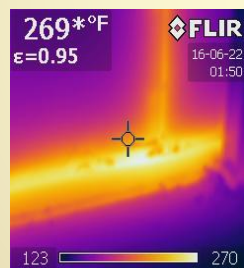
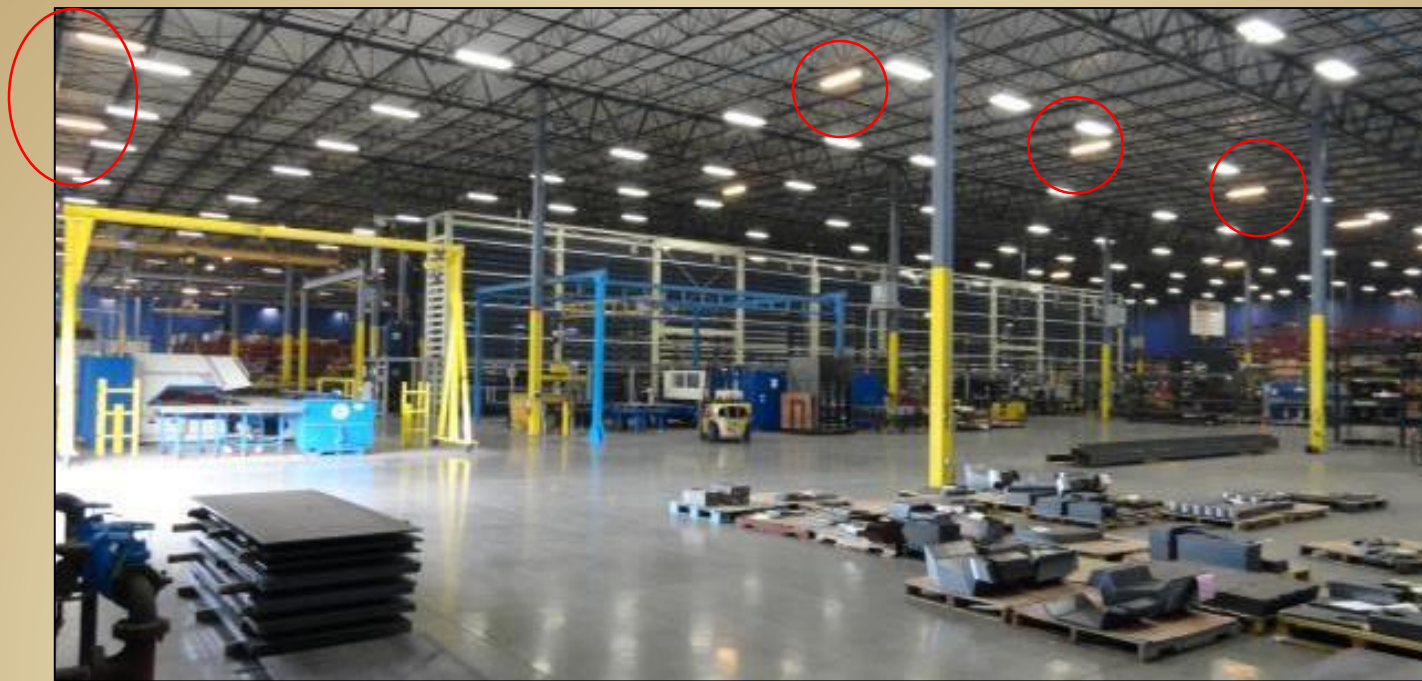
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wow! AN OLD PENNY!



CARRIER





Company A

- Brake-manufacturing company
- Chemical finishing department – 1.8 million gals. of water
- Continuous supply of fresh water for chrome rinse tank

Company A



Company A

- Added conductivity sensor, less than \$700
- Saved 60,000 gallons of water, \$14,600/year
- Total – 1.8 million gallons of water; 24,500 kWh; \$45,800
- Company investment - \$3,000

Company B

- Third year of program
- Electric air dryer for industrial parts
 - Two 15 kW dryers
 - 9.5 hours/day
 - 70,000 kWh/year
 - \$5,400/year

Company B



Company B

- Added simple timer, less than \$50
- Approximately one hour/day
- Saved 64,000 kWh/year, \$5,000/year
- Total – 342,715 kWh; 444,000 gals. of water; \$29,000/year
- Company investment - \$4,400

Questions?

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